In the claims:

This listing of claims will replace all prior versions and listings of claims in the application:

1. (Original) A method of operating a laser to obtain an output pulse of laser radiation having a single wavelength, the laser including a resonator, a gain medium positioned inside the resonator and a pump source, the method comprising:

inducing an intracavity loss into the resonator, the loss being an amount that prevents oscillation during a time that energy from the pump source is being stored in the gain medium;

building up gain with energy from the pump source in the gain medium until formation of a single-frequency relaxation oscillation pulse in the resonator; and

reducing the intracavity loss induced in the resonator upon the detection of the relaxation oscillation pulse so that built-up gain stored in the gain medium is output from the resonator as a output pulse at the single frequency.

2. (Original) The method of claim 1, wherein

the gain medium comprises a neodymium-doped solid-state material, and the single frequency is approximately 1.05 microns.

3. (Original) The method of claim 1, wherein said pump source comprises a source of optical energy.

4. (Original) The method of claim 1, wherein said pump source comprises a flashlamp.

5. (Original) The method of claim 1, wherein said pump source comprises one or more laser diodes.

6. (Original) The method of claim 1, wherein the resonator includes a Q-switch and polarizer, and said reducing comprises controlling the Q-switch.

7. (Original) The method of claim 1, wherein the resonator includes an electronically controlled Pockels cell, and said reducing comprises controlling the Pockels cell.

8. (Original) The method of claim 1, including generating a plurality of output pulses having substantially constant pulse amplitude and pulse width by repeating said inducing, building up and reducing steps.

9. (Original) The method of claim 1, wherein the output pulse has a pulse width of less than 30 nanoseconds, full-width half-maximum.

10. (Original) The method of claim 1, wherein the resonator includes an output coupler having a controllable reflectivity, and including controlling the reflectivity of output coupler to establish a desired pulse width.

11. (Original) The method of claim 1, wherein the resonator includes an output coupler comprising a polarizing beam splitter, and including controlling the reflectivity of output coupler by controlling polarization inside the resonator.

12. (Original) The method of claim 1, wherein the resonator includes an output coupler comprising a polarizing beam splitter, and said inducing intracavity loss includes setting an amount of intracavity light that is transmitted by the polarizing beam splitter.

13. (Original) The method of claim 1, wherein the resonator includes an output coupler comprising a polarizing beam splitter, and said inducing intracavity loss includes inserting a polarization rotation element in the resonator to set an amount of light that is transmitted by the polarizing beam splitter.

14. (Original) The method of claim 1, wherein the resonator includes an electronically controlled Pockels cell, and the resonator includes an output coupler comprising a

polarizing beam splitter, and including controlling the reflectivity of output coupler by controlling polarization inside the resonator using the Pockels cell.

15. (Original) The method of claim 1, wherein the resonator includes an electronically controlled Pockels cell, and said reducing comprises controlling voltage pulses applied to the Pockels cell, and wherein the resonator includes an output coupler comprising a polarizing beam splitter, and including controlling the reflectivity of output coupler by controlling the voltage pulses applied to the Pockels cell during said reducing.

16. (Original) The method of claim 1, including detecting an onset of the relaxation oscillation pulse prior to a peak of the relaxation oscillation pulse, at a point occurring at less than 5% of average peak power of such pulses.

17. (Original) The method of claim 1, including detecting an onset of the relaxation oscillation pulse prior to a peak of the relaxation oscillation pulse, at a point occurring at less than 1% of average peak power of such pulses.

18. (Original) The method of claim 1, wherein the resonator includes a Q-switch and a polarizer, and including detecting an onset of the relaxation oscillation, and the reducing includes applying a control signal to the Q-switch in response to the detected onset prior to a peak of the relaxation oscillation pulse.

19. (Original) The method of claim 1, including positioning an aperture within the resonator to allow a single transverse mode in the output pulse.

20. (Original) The method of claim 1, wherein the resonator comprises a ring having an odd number of reflectors.

21. (Original) The method of claim 1, wherein the resonator comprises a ring, an including suppressing oscillation in one direction within the ring with components acting as an optical diode.

22. (Original) A laser system, comprising:

a laser resonator, comprising an output coupler;

a Q-switch in the resonator;

a gain medium in the resonator;

a source of energy, coupled with the gain medium, to pump the gain medium;

a detector, coupled with the resonator, to detect oscillation energy in the resonator; and

a controller, coupled to the source of energy, the Q-switch and the detector, to set conditions inducing loss in the resonator at a level allowing build up of gain in the gain medium to produce a relaxation oscillation pulse, and to decrease loss resonator using the Q-switch in response to detection of the relaxation oscillation pulse, so that an output pulse having a single frequency is generated.

23. (Original) The system of claim 22, wherein said output coupler comprises a controllable output coupler, and the controller increases reflectivity of the output coupler while decreasing loss in the resonator.

24. (Original) The system of claim 22, wherein said output coupler comprises a polarizing beam splitter.

25. (Original) The system of claim 22, including an etalon in the resonator arranged so that reflections of undesirable wavelengths are not coupled back into the resonator.

26. (Original) The system of claim 22, including a set of etalons in the resonator adapted to restrict oscillation to a single longitudinal cavity mode.

27. (Original) The system of claim 22, wherein the Q-switch comprises a Pockels cell, and the output coupler comprises a polarizing beam splitter.

28. (Original) The system of claim 22, wherein the gain medium comprises a neodymium-doped solid-state material, and the single frequency is approximately 1.05 μm.

29. (Original) The system of claim 22, wherein said pump source comprises a source of optical energy.

30. (Original) The system of claim 22, wherein said pump source comprises a flashlamp.

31. (Original) The system of claim 22, wherein said pump source comprises a laser diode.

32. (Original) The system of claim 22, wherein the detector detects an onset of the relaxation oscillation prior to a peak of the relaxation oscillation pulse.

33. (Original) The system of claim 22, wherein the detector detects an onset of the relaxation oscillation, and the controller applies a control signal to the Q-switch in response to the detected onset.

34. (Original) The system of claim 22, wherein the resonator is arranged as an optical ring, and including optical components in the resonator acting as an optical diode.

35. (Original) The system of claim 22, wherein the resonator is arranged as an optical ring having an odd number of reflectors.

36. (Original) The system of claim 22, wherein the resonator is arranged as an optical ring having an odd number of reflectors, including a flat reflector having an adjustable mount setting an angle of reflection, whereby adjustments of a length of the optical ring can be made by adjusting the angle of reflection of the flat reflector.

37. (Original) The system of claim 22, including a transverse mode limiting aperture in the laser resonator.

38. (Original) The system of claim 22, wherein the output coupler comprises a polarizing beam splitter, and including a polarization rotation element in the resonator to set an amount of light that is transmitted by the polarizing beam splitter during build up of gain.

39. (Original) The system of claim 22, wherein said output coupler comprises an output coupler having an adjustable reflectivity, and the controller sets an adjustable reflectivity of the output coupler to establish a pulse width.

40. (Original) The system of claim 22, wherein the Q-switch comprises a Pockels cell, and the output coupler comprises a polarizing beam splitter, and the controller applies an adjustable voltage to the Pockels cell when reducing loss in the resonator, the adjustable voltage establishing an amount of reflectivity of the output coupler to establish a pulse width.

41. (Original) The system of claim 22, wherein the output coupler comprises a polarizing beam splitter, and including a polarization rotation element in the resonator to set an amount of light that is transmitted by the polarizing beam splitter during build up of gain.

42. (Original) A laser system, comprising:

a laser resonator arranged as an optical ring, comprising a polarizer and a polarizing beam splitter arranged as an output coupler;

an optical diode in the resonator;

one or more etalons in the resonator;

a Pockels cell in the resonator;

a gain medium in the resonator;

a source of energy, coupled with the gain medium, to pump the gain medium;

a detector, coupled with the resonator, to detect oscillation energy in the resonator; and

a controller, coupled to the source of energy, the Pockels cell and the detector, to set conditions inducing loss in the resonator at a level allowing build up of gain in the gain medium to produce a relaxation oscillation pulse, and conditions decreasing loss resonator using the Pockels cell in response to detection of onset of the relaxation oscillation pulse, so that an output pulse having a single frequency is generated, and applying an adjustable voltage to the Pockels cell to adjust polarization within the resonator and thereby reflectivity of the polarizing beam splitter arranged as the output coupler, to set a pulse width during said conditions decreasing loss.

43. (Original) A method of operating a laser to obtain an output pulse of laser radiation having a single wavelength, the laser including a resonator arranged as an optical ring, a gain medium positioned inside the resonator and a pump source, the method comprising:

suppressing oscillation in one direction within the ring with components acting as an optical diode;

suppressing oscillation within the ring at wavelengths other than the single wavelength;

using a polarizing beam splitter as an output coupler;

setting polarization inside the resonator to induce an intracavity loss into the resonator, the loss being an amount that prevents oscillation during a time that energy from the pump source is being stored in the gain medium;

building up gain with energy from the pump source in the gain medium until formation of a single-frequency relaxation oscillation pulse in the resonator; and

changing polarization inside the resonator to reduce the intracavity loss induced in the resonator and to set a reflectivity of the polarizing beam splitter upon the detection of the relaxation oscillation pulse so that built-up gain stored in the gain medium is output from the resonator as a output pulse at the single frequency having a pulse width determined by the changed polarization.

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